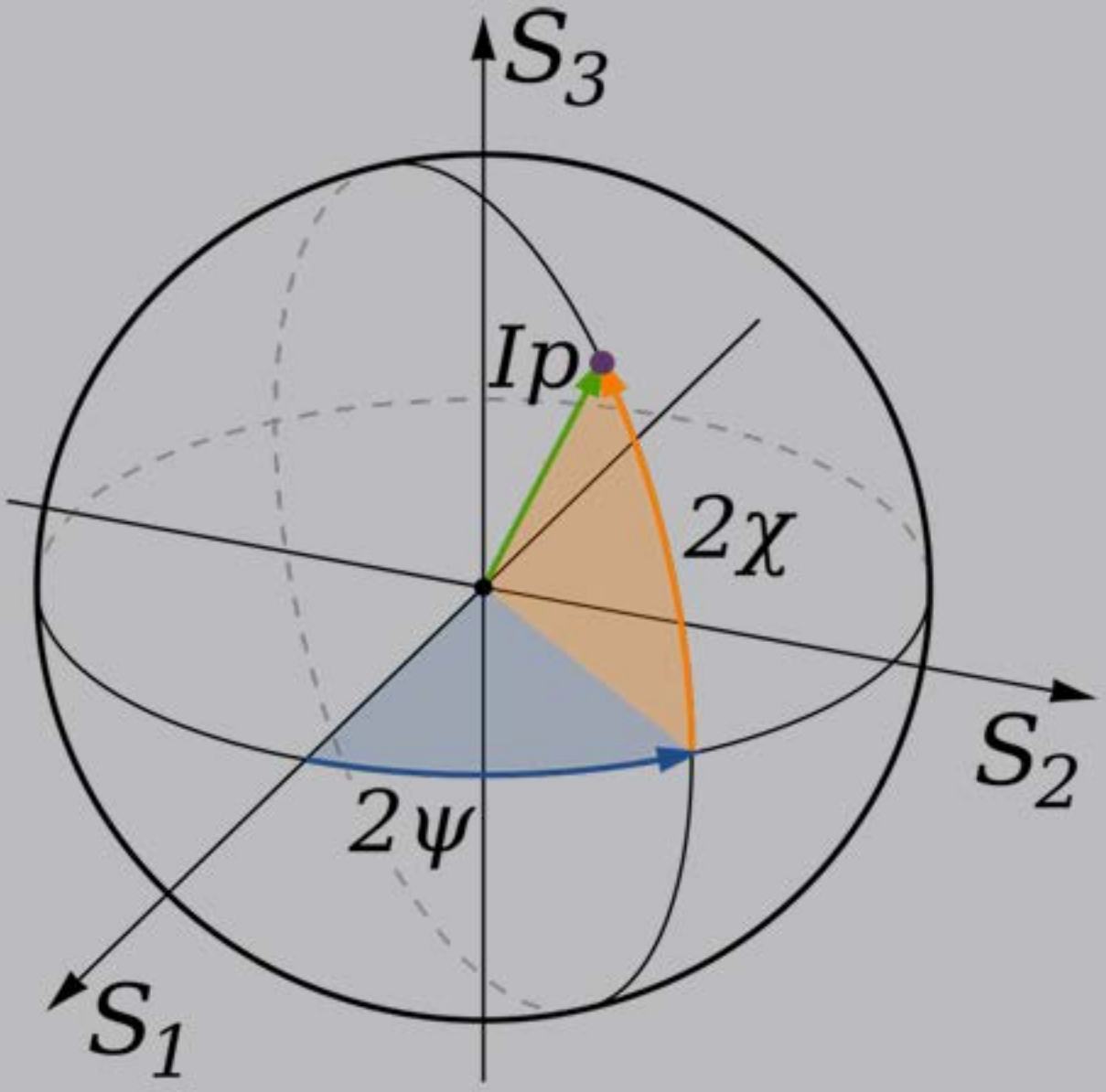
Henri Poincaré

LAST THOUGHTS



Translator: Nicolae Sfetcu

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BOOK PREVIEW

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Henri Poincaré is a mathematician, physicist, philosopher and engineer, born April 29, 1854 in Nancy and died July 17, 1912 in Paris. He has carried out works of major importance in optics and in infinitesimal calculus. His advances on the problem of the three bodies make him a founder of the qualitative study of systems of differential equations and chaos theory; he is also a major precursor of the theory of special relativity and the theory of dynamical systems. Henri Poincaré is considered one of the last great universal scholars, mastering all branches of mathematics of his time and some branches of physics.

This book gathers here various articles and lectures that Henri Poincaré himself intended to form the fourth volume of his works of scientific philosophy. All the previous ones had already appeared in this collection. It would be useless to recall their prodigious success. The most illustrious of modern mathematicians has been an eminent philosopher, one of those whose books profoundly influence human thought. It is probable that if Henri Poincaré himself had published this volume, he would have modified certain details, removed some repetitions. But it seemed to us that the respect due to the memory of this great death forbade any editing of his text.

1. THE EVOLUTION OF LAWS

Mr. Boutroux, in his work on the contingency of the laws of nature, wondered if natural laws are not likely to change, if while the world is changing continuously, the laws themselves, that is to say to say the rules according to which this evolution takes place, will be the only ones exempt from any variation. Such a conception has no chance of ever being adopted by scholars; in the sense that they would understand it, they could not adhere to it without denying the legitimacy and the very possibility of science. But the philosopher retains the right to ask himself the question, to consider the various solutions it entails, to examine the consequences of it, and to seek to reconcile them with the legitimate demands of scientists. I would like to consider some of the aspects that the problem may take; I shall thus be led not to conclusions proper, but to various reflections which may not be without interest. If, on the way, I allow myself to speak a little longer about certain related questions, please forgive myself.

I

Let's first look at the mathematician's point of view. Let us admit for a moment that the physical laws have undergone variations in the course of ages, and ask ourselves if we should have a means of perceiving them. Let us not forget at first that the few centuries during which humanity lived and thought were preceded by incomparably longer periods in which man did not yet live; they will undoubtedly be followed by other periods when our species will have disappeared. If one wants to believe in an evolution of the laws, it cannot be, without contradiction, other than very slow, so that, during the few years that one thought, the laws of the nature could undergo only insignificant changes. If they have evolved in the past, then we must understand the geological past. Were the laws of former times those of today, the laws of tomorrow will still be the same? When we ask such a question, what meaning should we attach to words once, today and tomorrow? Today are the times whose history has preserved the memory; in the past, millions of years preceded history, and ichthyosaurs lived quietly without philosophizing; tomorrow, it is the millions of years that will come next, where the Earth will be cooled and where the man will have no more eyes to see or brain to think.

That put, what is a law? It is a constant link between the antecedent and the consequent, between the current state of the world and its immediate later state. Knowing the present state of every part of the universe, the ideal scientist who knew all the laws of nature would have fixed rules to deduce from them the state that these same parties will have the next day; it is conceivable that this process can be continued indefinitely. From Monday's state of the world, one will deduce that of Tuesday; knowing that of Tuesday, it will be deduced by the same methods that of Wednesday; And so on. But that's not all ; if there is a constant link between the state of Monday and that of Tuesday, we can deduce the second from the first, but we can do the opposite, that is to say that if we know the state of Tuesday, we can conclude that of Monday; from the state of Monday we will conclude likewise with that of Sunday, and so on; we can go back in time and we can go down. With the present and the laws, one can guess the future, but one can also guess the past. The process is essentially reversible.

Since we place ourselves here from the point of view of the mathematician, it is advisable to give this conception all the precision which it implies if we use mathematical language for it. We shall then say that the set of laws is equivalent to a system of differential equations which link the velocities of variations of the various elements of the universe to the present values of these elements.

Such a system comprises, as we know, an infinity of solutions; but if we give ourselves the initial values of all the elements, that is to say their values at the moment **t = 0**, (the one that in the ordinary language we call the present) the solution is entirely determined, so that we can compute the values of all the elements at any time, that we suppose **t > 0**, which corresponds to the future, that we suppose **t < 0**, which corresponds to the past. What is important to remember is that the way of concluding from present to past is not different from how to conclude from the present to the future.

What means do we have then to know the geological past, that is to say the history of the times when the laws could have formerly varied? This past could not be directly observed and we only know it by the traces it has left in the present, we only know it by the present, and we can only deduce it from the process that we have just described, and which would also allow us to deduce the future. But is this process able to reveal changes in the laws? Obviously not; we cannot precisely apply it except by supposing that the laws have not changed; we know only the state of Monday, for example, and the rules which bind the state of Sunday to that of Monday; the application of these rules will then make us know the state of the Sunday; but if we wish to go further and deduce the state of Saturday, we must of necessity admit that the same rules which enabled us to go back up from Monday to Sunday, were still valid between Sunday and Saturday. Without this, the only conclusion we would be allowed is that it is impossible to know what happened on Saturday. If then the immutability of the laws appears in the premises of all our reasonings, we cannot to not find it in our conclusions.

A. Leverrier, knowing the current orbits of the planets, calculates, using Newton's law, what will have become these orbits in 10,000 years. However, he directs his calculations, he will never be able to find that Newton's law will be false in a few thousand years. He could, by simply changing the sign of time in his formulas, calculate what these orbits were 10,000 years ago; but it is certain in advance not to find that Newton's law has not always been true.

In short, we can know nothing of the past except on the condition of admitting that the laws have not changed; if we admit it, the question of the evolution of the laws does not arise; if we do not admit it, the question is insoluble, as are all those that relate to the past.

II

But it will be said, could it not be that the application of the preceding process would lead to a contradiction, or, if one wishes, that our differential equations admit no solution? Since the hypothesis of the immutability of laws, posited at the beginning of all our reasoning, would lead to an absurd consequence, we would have shown by absurdum that they have evolved, while being forever powerless to know in what sense.

Since our process is reversible, what we have just said applies in the future, and there seem to be cases where we could say that before that date the world must perish or change its laws; if for example the calculation shows us that at this date, one of the quantities we have to consider must become infinite, or take a physically impossible value. To perish, or to change its laws, is almost the same thing; a world that no longer has the laws of ours, it would no longer be our world, it would be another.

Is it possible that the study of the present world and its laws will lead us to formulas exposed to similar contradictions? Laws are obtained by experience; if they teach us that the state ***A*** of Sunday causes the state ***B*** of Monday, it is because we observed the two states ***A*** and ***B***; therefore, none of these two

states is physically impossible. If we continue the process, and if we conclude by passing every day from one day to the next, from state **A** to state ***B***, then from state ***B*** to state ***C***, then from state ***C*** to state ***D***, etc., that is all these states are physically possible; because if the state ***D*** for example was not, one could never have done experiment proving that the state ***C*** generates after one day the state ***D***. However far the deductions are pushed, we will never reach a physically impossible state, that is, a contradiction. If one of our formulas was not exempt, it would be that we would have exceeded the experience, it would have been extrapolated. Suppose, for example, that it has been observed that in such and such a circumstance the temperature of a body drops by one degree per day; if it is currently 20° for example, we will conclude that in 300 days it will be -280°; and this will be absurd, physically impossible, since the absolute zero is at -273°. What to say? Had it been observed that the temperature passed in a day from -279° to -280°? No, no doubt, since these two temperatures are unobservable. It had been seen, for example, that the law was true at about 0° and 20°, and it had been wrongly concluded that it should be true even to -273° and even beyond; an illegitimate extrapolation was made. But there is an infinity of ways to extrapolate an empirical formula, and among them one can always choose one that excludes physically impossible states.

We know the laws only imperfectly; experience only limits our choice, and among all the laws it allows us to choose, we will always find those which do not expose us to a contradiction of the kind of those which we have just spoken of and which could oblige us to conclude against immutability. This means of demonstrating such a development still escapes us, whether it is to demonstrate that the laws will change, or that they have changed.

III

At this point, we can oppose an argument of fact. "You say that in seeking to ascend, thanks to the knowledge of the laws, from the present to the past, one will never meet with a contradiction, and yet the scientists have met with it, from which it does not seem that one can escape as easily as you think. That they are only apparent, that we may preserve the hope of lifting them, I grant you; but according to your reasoning, even an apparent contradiction should be impossible."

Let's quote an example immediately. If we calculate from the laws of thermodynamics, the time from which the sun has been able to send us its heat, we find about 50 million years; this time cannot suffice for geologists; not only has the evolution of organized forms not been able to take place so rapidly - this is a point on which we could discuss - but the deposition of layers where we find remains of plants or animals which do not were able to live without sun, required a number of years perhaps ten times greater.

What has made the contradiction possible is that the reasoning on which the geological evidence is based differs very much from that of the mathematician. Observing identical effects, we conclude to the identity of the causes, and for example by retracing the fossil remains of animals belonging to a family currently alive, we conclude that at the time when the layer containing these fossils, the conditions without which the animals of this family could not live, were all realized at once.

At first sight, it is the same thing that the mathematician did, whose point of view we had adopted in the preceding paragraphs; he, too, concluded that since the laws had not changed, identical effects could only have been produced by identical causes. There is one essential difference, however. Let us consider the state of the world, at a given instant, and at another previous instant; the state of the

world, or even that of a very small part of the world, is something extremely complex and depends on a very large number of elements. I suppose, to simplify the exposition, only two elements, so that two data suffice to define this state. At the next moment, these data will be for example ***A*** and ***B***; at the previous moment ***A′*** and ***B′***.

The formula of the mathematician, constructed with all the observed laws, teaches him that the state ***AB*** can only have been generated by the previous state ***A′B′***; but if he knows only one of the data, ***A*** for example, without knowing if it is accompanied by the other data ***B***, its formula does not allow him any conclusion. At most, if the phenomena ***A*** and ***A′*** appear to be related to each other, but relatively independent of ***B*** and ***B′***, conclude from ***A*** to ***A′***; in any case, it will not deduce the double circumstance ***A′*** and ***B′*** from the unique circumstance ***A***. The geologist, on the other hand, observing the effect ***A*** alone, will conclude that it could only be produced by the combination of the causes ***A′*** and ***B′*** who often give birth to it before our eyes; for in many cases this effect ***A*** is so special that another combination of causes leading to the same effect would be absolutely improbable.

If two organisms are identical or merely analogous, this analogy cannot be due to chance, and we can affirm that they lived under such conditions; finding the debris, we shall be sure not only that it has pre-existed a germ analogous to that from which we see similar beings coming out, but that the external temperature was not too high for this germ to develop. Otherwise these debris could only be a *ludus naturæ*, as was believed in the seventeenth century; and it is useless to say that such a conclusion absolutely shocks reason. The existence of organized debris is, moreover, only an extreme case more striking than the others, and without leaving the mineral world, we could have cited examples of the same kind.

The geologist can therefore conclude where the mathematician would be powerless. But we see that it is no longer guaranteed against contradiction as was the mathematician. If from a single circumstance, he concludes to multiple previous circumstances; if the extent of the conclusion is somewhat greater than that of the premises, it is possible that what one infers from one observation is at odds with what one will learn from another. Each isolated fact becomes, so to speak, a center of irradiation: from each of them the mathematician deduced a unique fact; the geologist deduces from it multiple facts; from the luminous point which is given to it, it makes a brilliant disc more or less extended; two bright spots will then give him two disks that can encroach on each other, hence the possibility of a conflict. For example if he finds in a layer of mollusks that cannot live below 20°, he will conclude that the seas of this time were hot; but if afterwards one of his colleagues discovered in the same stratum of other animals that a temperature of more than 5° would be killed, he would conclude that these seas were cold.

There may be reason to hope that the observations will not contradict each other in fact, or that the contradictions will not be irreducible, but we are no longer guaranteed, as it were, against the risk of a contradiction by the very rules of formal logic. And then we may ask ourselves whether, in reasoning like geologists, we will not someday fall into some absurd consequence, so that we will have to conclude that the laws are mutable.

IV

Let me digress here. We have just seen that the geologist possesses an instrument which the mathematician misses and which enables him to conclude from the present to the past. Why does the

same instrument not allow us to conclude from the present in the future? If I see a twenty-year-old man, I'm sure he has gone through all the stages from childhood to adulthood, and therefore that there has not been for twenty years on Earth a cataclysm that destroyed all life, but that does not prove to me that there will not be one in twenty years from now. We have, to know, the past of the weapons that we miss when it comes to the future, and that is why the future appears to us more mysterious than the past.

I cannot refrain here from referring to an article I have written on chance; I recalled the opinion of Mr. Lalande who had said, on the contrary, that if the future is determined by the past, but the past is not determined by the future. According to him, a cause can produce only one effect, while the same effect can be produced by several different causes. If it were so, it would be the past that would be mysterious and the future that would be easy to know.

I could not adopt this opinion, but I showed what it could have been the origin. The principle of Carnot shows us that energy, which nothing can destroy, is likely to dissipate. Temperatures tend to equalize, the world tends towards uniformity, that is to say toward death. Large differences in causes therefore produce only small differences in effects. As soon as the differences in the effects become too small to be observable, we have no longer any means of knowing the differences which formerly existed between the causes which gave rise to them, however great these differences were.

But it is precisely because everything tends towards death, that life is an exception that needs to be explained.

If rolling pebbles are abandoned at random on a mountain, they will all eventually fall into the valley; if we find one at the bottom, it will be a banal effect and will not tell us about the previous history of the pebble; we will not be able to know in what point of the mountain it was first placed. But if, by chance, we meet a stone in the neighborhood of the summit, we can affirm that it has always been there, since as soon as it was on the slope, it would have rolled to the bottom; and our certainty will be even greater as the case is more exceptional and it is more likely not to occur.

V

I raised this question incidentally only; it deserves to be thought about; but I do not want to be dragged too far from my subject. Is it possible that the contradictions of geologists never lead scientists to conclude the evolution of laws? Let us first observe that it is only in the youth of the Science that they employ the reasonings by analogy for which present geology is obliged to be satisfied. As it develops, it comes closer to the state that astronomy and physics seem to have already reached and where laws are likely to be stated in mathematical language. That day, what we said at the beginning of this work, will become true again without restriction. But many people think that all sciences are called to undergo more or less quickly, and one after another, the same evolution. If this were so, the difficulties that might arise would be only temporary, they would be destined to vanish as soon as the sciences had emerged from childhood.

But we do not need to wait for this uncertain future. What is geologist's reasoning by analogy? A geological fact seems to him so like a present fact that he cannot attribute this similarity to chance. He thinks he can explain it only by supposing that these two facts have occurred under exactly the same conditions. And he would imagine that the conditions were identical, except that point of detail that

the laws of nature had varied in the interval, the whole world would have changed completely to the point of becoming unrecognizable. He would affirm on the one hand that the temperature must have remained the same, whereas, as a result of the upheaval of all physics, the effects of temperature would have become quite different, so that the very word of temperature would have lost all sense. Of course, whatever happens, it will never be with such a conception that it will stop. The way he conceives logic is absolutely opposed to it.

VI

And if humanity were to last longer than we have supposed, long enough to see the laws evolve before its eyes? Or even if it came to acquire instruments delicate enough that this variation, slow as it is, becomes sensitive after a few generations? It would not then be by induction, by inference, that we would know the changes of the laws, it would be by direct observation. Would not the previous reasonings lose all value? The memoirs in which the experiences of our predecessors are reported would still be vestiges of the past, which would only give us an indirect knowledge of the past. The old documents are for the historian what the fossils are for the geologist, and the works of the old scientists would be only old documents. They would only inform us of the thought of these scholars in so far as the old men would be like us. If the laws of the world were to change, all parts of the universe would suffer the consequences and humanity could not escape; admitting that it could survive in a new environment, it would have to change to adapt to it. And then the language of the old men would become incomprehensible to us; the words they used would no longer make sense to us or would have a different sense than for them. Is it not already what happens after a few centuries, although the laws of physics have remained unchangeable?

And then we always fall back into the same dilemma: either the documents of the past will have remained perfectly clear to us, and it will be then that the world has remained the same, and they will not be able to teach us anything else; or they will become indecipherable enigmas, and they will not be able to teach us anything at all, not even that the laws have evolved; we know enough that it is not necessary for them to be for us a dead letter.

Besides, the old men, like ourselves, have never had natural laws but fragmentary knowledge. We would always find a way to connect these two fragments even if they had remained intact; even more so if we have nothing left of the older one than a weakened, uncertain and half-effaced image.

VII

Let us now turn to another point of view. The laws that direct observation gives us are never more than results. Take for example the law of Mariotte. For most physicists, this is only a consequence of the kinetic theory of gases; the gaseous molecules are animated with considerable velocities, they describe complicated trajectories whose exact equation could be written if we knew according to what laws they attract or repel each other. By reasoning on these trajectories according to the rules of calculating probabilities, we succeed in demonstrating that the density of a gas is proportional to its pressure.

The laws governing the observable bodies are therefore only consequences of the molecular laws.

Their simplicity would only be apparent and hide an extremely complex reality since complexity would be measured by the very number of molecules. But it is precisely because this number is so great that differences of detail would be mutually compensating and that we would believe in harmony.

And the molecules themselves are perhaps worlds; their laws are perhaps only results, and to find the reason, it would be necessary to go down to the molecules of molecules, without knowing where we will end up.

The observable laws then depend on two things, the molecular laws and the arrangement of the molecules. It is the molecular laws that enjoy immutability since they are the true laws and the others are only appearances. But the arrangement of the molecules can change and with it the observable laws. And that would be a reason to believe in changing laws.

VIII

I suppose a world whose various parts possess a heat conductivity so perfect that they are constantly in equilibrium of temperature. The inhabitants of this world would have no idea of what we call temperature difference; in their treatises on physics, there would be no chapter devoted to thermometry. Other than these treaties could be quite complete, and they would teach a lot of laws, much simpler even than ours.

Now imagine that this world is slowly cooling down by radiation; the temperature will remain everywhere uniform, but it will diminish with time. I suppose one of its inhabitants falls into lethargy and wakes up after a few centuries; we will admit, since we have already supposed so many things, that he can live in a colder world and that he has preserved the memory of things formerly. He will see that his descendants still do physics treatises, that they continue not to talk about thermometry, but that the laws they teach are very different from those he has known. For example, it has been taught that water boils under a pressure of 10 millimeters of mercury, and new physicists will observe that to boil it must be lowered to 5 millimeters. Such a body that he once knew as liquid will only appear in a solid state, and so on. The mutual relations of the various parts of the universe all depend on the temperature and as soon as it changes everything is upset.

Well, do we know if there is not some physical entity, as unknown to us as the temperature was for the inhabitants of this fantasy world? Do we know if this entity does not vary constantly like the temperature of a globe that loses its heat by radiation, and if this variation does not lead to that of all the laws?

IX

Let us return to our imaginary world and ask ourselves if its inhabitants could not, without renewing the history of the sleepers of Ephesus, perceive this evolution. No doubt, no matter how perfect the heat conductivity on their planet, it would not be absolute, so that extremely slight differences in temperature would still be possible. They would long escape observation, but perhaps there would come a day when one would imagine more sensitive measuring devices and where a physicist of genius would bring out these almost imperceptible differences. A theory would be constructed, one would see that these differences of temperature have an influence on all the physical phenomena, and finally

some philosopher, whose views would seem hazardous and reckless to most of his contemporaries, would affirm that the average temperature of the universe could have varied in the past and with it all known laws. Could not we do something similar? For example, the fundamental laws of Mechanics have long been considered absolute. Today some physicists say that they must be modified, or rather enlarged; that they are only true for the speeds to which we are accustomed; that they would cease to be so for speeds comparable to that of light; and they support their view of certain experiments made with radium. The old laws of Dynamics are none the less virtually true to the world around us. But could it not be said with some semblance of reason that, owing to the constant dissipation of energy, the velocities of bodies must have tended to diminish, since their living force tended to become heat; that going back far enough in the past, one would find a time when speeds comparable to that of light were not exceptional, where consequently the classical laws of Dynamics were not yet true?

Suppose, on the other hand, that the observable laws are only results, depending at the same time on the molecular laws and the arrangement of the molecules; When the progress of science has made us acquainted with this dependence, we will no doubt be able to conclude that, by virtue of the molecular laws, the arrangement of molecules must have been formerly different from what it is today, and by consequently, observable laws have not always been the same. We would therefore conclude with the variability of the laws, but, as we remark it, it would be by virtue of the very principle of their immutability. We would argue that the apparent laws have changed, but that would be because the molecular laws, which we would now see as the true laws, would be proclaimed immutable.

X

Thus there is not a single law that we can state with the certainty that it has always been true in the past with the same approximation as today, I will say more, with the certainty that we will never be able to demonstrate that it was wrong once. And yet, there is nothing there that can prevent the scientist from keeping his faith to the principle of immutability, since no law can ever descend to the rank of a transitory law, than to be replaced by another more general law and more comprehensive; that it will not even have its disgrace until the advent of this new law, so that there will be no interregnum and that the principles will remain safe; that it will be through them that the changes will be made, and that these revolutions themselves will appear to be a striking confirmation of them.

It will not even happen that we will find variations by experience or by induction, and that we will explain them afterwards by trying to make everything fit into a more or less artificial synthesis. No, it will be the synthesis that will come first, and if we admit variations, it will be to not disturb it.

XI

So far, we have not seemed to worry about whether laws actually vary, but only if men can believe them to be variable. Are laws considered to exist outside the mind that creates or observes them immutable in themselves? Not only is the question insoluble, but it makes no sense. What is the use of wondering if in the world of things in itself the laws may vary with time, whereas in such a world the word of time may be meaningless? From what this world is, we can say nothing, or think nothing, but only from what it appears or could appear to intelligences that do not differ too much from ours.

The question thus posed has a solution. If we consider two spirits similar to ours, observing the universe on two different dates, separated for example by millions of years, each of these minds will build a science, which will be a system of laws deduced from the observed facts. It is likely that these sciences will be very different and, in this sense,, one could say that the laws have evolved. But however great the gap may be, we shall always be able to conceive an intelligence of the same nature as ours, but of far greater significance, or called to a longer life, which will be able to synthesize and unite in a unique, perfectly coherent formula, the two fragmentary and approximate formulas to which the two ephemeral researchers had arrived in the short time at their disposal. For him, the laws will not have changed, the science will be immutable, it will be only the scientists who have been imperfectly informed.

To take a geometric comparison, suppose that we can represent the variations of the world by an analytic curve. Each of us can see only a very small arc of this curve; if he knew him exactly, that would be enough for him to establish the equation of the curve, and to be able to prolong it indefinitely. But he has only an imperfect knowledge of this arc and he can be mistaken about this equation: if he tries to prolong the curve, the line he will draw will deviate from the real curve, especially since the known arc will be less extensive, and we will wish to extend the prolongation of this arc. Another observer will only know another bow and will know it also imperfectly only.

If the two workers are far from each other, these two extensions which they will trace will not be connected; but this does not prove that an observer with a longer view, who would directly perceive a greater length of curve, so as to embrace both these arches, would not be able to write a more exact equation and reconcile their divergent formulas; and even, however capricious the real curve may be, there will always be an analytic curve, which, for as long as one wants, will deviate as little as one likes.

No doubt many readers will be shocked to see that at any moment I seem to be replacing the world with a system of simple symbols. It's not just a professional mathematician's habit; the nature of my subject absolutely imposed this attitude on me. The Bergsonian world has no laws; what can be of it is simply the more or less distorted image that the scientists have of it. When we say that nature is governed by laws, we hear that this portrait is still rather resembling. It is therefore only on him and on him that we must reason, on pain of seeing the very idea of law which was the object of our study vanish. But this image is removable; we can dissect it into elements, distinguish external moments from each other, independent parts. That if I have sometimes oversimplified and reduced these elements to too few, this is only a matter of degree: it did not change the nature of my reasoning and their scope; the exhibition simply became shorter.

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Book

Henri Poincaré is a mathematician, physicist, philosopher and engineer, born April 29, 1854 in Nancy and died July 17, 1912 in Paris. He has carried out works of major importance in optics and in infinitesimal calculus. His advances on the problem of the three bodies make him a founder of the qualitative study of systems of differential equations and chaos theory; he is also a major precursor of the theory of special relativity and the theory of dynamical systems. Henri Poincaré is considered one

of the last great universal scholars, mastering all branches of mathematics of his time and some branches of physics.

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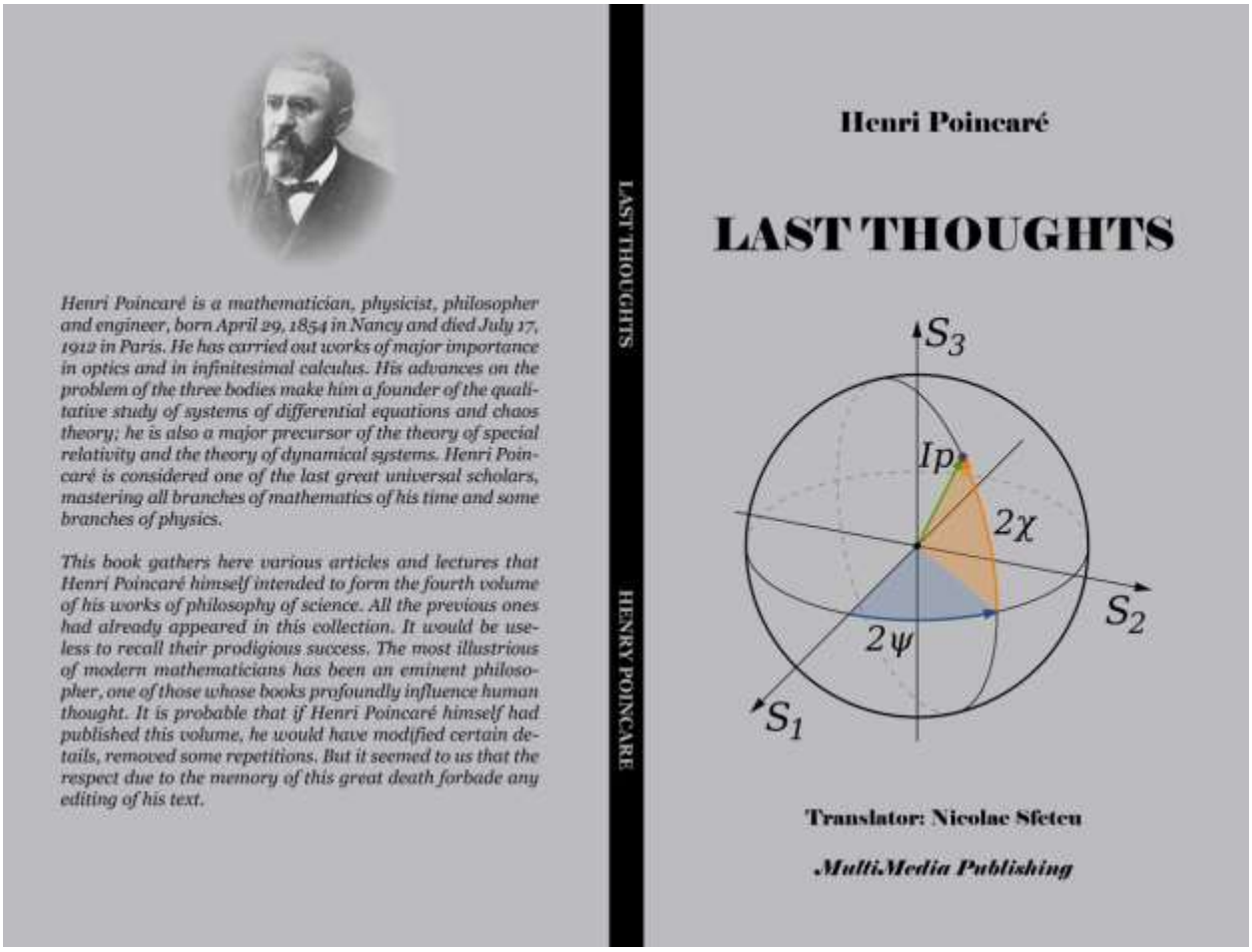

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- 6.4 DISCUSSION OF THE PREVIOUS HYPOTHESIS
- 6.5 QUANTA OF ACTION
- 6.6 THE NEW THEORY OF PLANCK
- 6.7 THE IDEAS OF MR. SOMMERFELD
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8. MORALITY AND SCIENCE
9. THE MORAL UNION
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Publishing House
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About the translator

Nicolae Sfetcu

Owner and manager with MultiMedia SRL and MultiMedia Publishing House.

Project Coordinator for European Teleworking Development Romania (ETD)

Member of Rotary Club Bucuresti Atheneum

Cofounder and ex-president of the Mehedinti Branch of Romanian Association for Electronic Industry and Software

Initiator, cofounder and president of Romanian Association for Telework and Teleactivities

Member of Internet Society

Initiator, cofounder and ex-president of Romanian Teleworking Society

Cofounder and ex-president of the Mehedinti Branch of the General Association of Engineers in Romania

Bachelor of Science (Physics, Nuclear Physics). Master of Philosophy.

Contact

Email: nicolae@sfetcu.com
WhatsApp: +40745526896
Online Media: https://www.setthings.com/

Facebook/Messenger: https://www.facebook.com/nicolae.sfetcu
Twitter: http://twitter.com/nicolae
LinkedIn: http://www.linkedin.com/in/nicolaesfetcu
YouTube: https://www.youtube.com/c/NicolaeSfetcu

Other books

Other books written or translated by the same author:

- A treia lege a lui Darwin - O parodie reală a societăţii actuale (RO)
- Ghid Marketing pe Internet (RO)
- Bridge Bidding - Standard American Yellow Card (EN)
- Telelucru (Telework) (RO)
- Harta politică - Dicţionar explicativ (RO)
- Beginner's Guide for Cybercrime Investigators (EN)
- How to... Marketing for Small Business (EN)
- London: Business, Travel, Culture (EN)
- Fizica simplificată (RO)
- Ghid jocuri de noroc - Casino, Poker, Pariuri (RO)
- Ghid Rotary International - Cluburi Rotary (RO)
- Proiectarea, dezvoltarea şi întreţinerea siturilor web (RO)
- Facebook pentru afaceri şi utilizatori (RO)
- Întreţinerea şi repararea calculatoarelor (RO)
- Corupţie - Globalizare - Neocolonialism (RO)
- Traducere şi traducători (RO)

- Small Business Management for Online Business - Web Development, Internet Marketing, Social Networks (EN)
- Sănătate, frumusețe, metode de slăbire (RO)
- Ghidul autorului de cărţi electronice (RO)
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- European Union Flags - Children's Coloring Book (EN)
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- Steagurile Uniunii Europene - Carte de colorat pentru copii (RO)
- Paşti (Paşte) - Cea mai importantă sărbătoare creştină (RO)
- Moartea - Aspecte psihologice, ştiinţifice, religioase, culturale şi filozofice (RO)
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- How to Translate - English Translation Guide in European Union (EN)
- ABC Petits Contes (Short Stories) (FR-EN), par Jules Lemaître
- Short WordPress Guide for Beginners (EN)
- ABC Short Stories - Children Book (EN), by Jules Lemaître
- Procesul (RO), de Franz Kafka
- Fables et légendes du Japon (Fables and Legends from Japan) (FR-EN), par Claudius Ferrand
- Ghid WordPress pentru începători (RO)
- Fables and Legends from Japan (EN), by Claudius Ferrand
- Ghid Facebook pentru utilizatori (RO)
- Arsène Lupin, gentleman-cambrioleur (Arsene Lupin, The Gentleman Burglar) (FR-EN), par Maurice Leblanc
- How to SELL (eCommerce) - Marketing and Internet Marketing Strategies (EN)
- Arsène Lupin, The Gentleman Burglar (EN), by Maurice Leblanc
- Bucharest Tourist Guide (Ghid turistic Bucureşti) (EN-RO)
- Ghid turistic Bucureşti (RO)
- Ghid WordPress pentru dezvoltatori (RO)
- French Riviera Tourist Guide (Guide touristique Côte d'Azur) (EN-FR)
- Guide touristique Côte d'Azur (FR)
- Ghid pagini Facebook - Campanii de promovare pe Facebook (RO)
- Management, analize, planuri şi strategii de afaceri (RO)
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- Indian Fairy Tales (Contes de fées indiens) (EN-FR), by Joseph Jacobs
- Contes de fées indiens (FR), par Joseph Jacobs
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